



# Energetic reasoning and mixed-integer linear programming for scheduling with a continuous resource and linear efficiency functions

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| Résumé en anglais   | <p>This paper addresses a scheduling problem with a continuously divisible, cumulative and renewable resource with limited capacity. During its processing, each task consumes a part of this resource, which lies between a minimum and a maximum requirement. A task is finished when a certain amount of energy is received by it within its time window. This energy is received via the resource and an amount of resource is converted into an amount of energy with a non-decreasing and continuous function. The goal is to find a feasible schedule, which is already NP-complete, and then to minimize the resource consumption. For the case where all functions are linear, we present two new mixed-integer linear programs (MILP), as well as improvements of an existing formulation. We also present a detailed version of the adaptation of the well-known “left-shift/right-shift” satisfiability test for the cumulative constraint and the associated time-window adjustments to our problem. For this test, three ways of computing relevant intervals are described. Finally, a hybrid branch-and-bound using both the satisfiability test and the MILP is presented with a new heuristic for choosing the variable on which the branching is done. Computational experiments on randomly generated instances are reported in order to compare all of these solution methods.</p> |
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